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ABSTRACT

Data on attention span, engaged rates, grade levels, and achievement, obtained from the Follow Through Longitudinal Study, were analyzed to examine relationships among the factors which tend to identify exemplary practices schools can adopt to increase the impact of the available time on student achievement. The sample included low income students from kindergarten through the fourth grade. Observations of each student in reading and mathematics classes were based on the Time Off Task observation instrument. Students also took the Stanford Achievement Test or the California Achievement Test. A trend was observed for children's engaged rates to increase from kindergarten to fourth grade. Those students with higher engaged rates appeared to score higher on the achievement tests than did students with lower engagement rates. Implications for planning classroom activities are offered. (CB)

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ENGAGED RATES: DOES GRADE LEVEL MAKE A DIFFERENCE?

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ENGAGED RATES: DOES GRADE LEVEL MAKE A DIFFERENCE?

The ideas for this paper originated from observations of two kindergarten teachers responding with zeal to the principal's challenge to increase students' engaged rates. Dismayed at their teacher's rigid expectations to stay on task, the five-year-old students became reluctant and tearful learners. A need for the assessment of reasonable guidelines for expected engaged rates for children of different age groups was evident. Although investigations of time and learning have a long history in educational research and psychology (e.g. Suppes, 1964; Underwood, 1949; Woodrow, 1940; Thompson, 1915; Washburne, 1925), systematic studies of effective use of teacher and student time spent in school did not gain prominence until the mid 1970s.

The past ten years have seen a dramatic increase in the number of studies which specifically look at the time students spend on specified tasks and the relationship of that time with achievement scores (Anderson, 1976; Berliner, 1979; Brophy, 1979; Stallings, in press). Not surprisingly, these studies have demonstrated that students who remain on task during instruction have higher achievement than students who are off-task. Wang and Walberg (1983) noted that

> "Results from several studies (e.g. Denham & Lieberman, 1980; Rutter,et. al 1979) and recent reviews of teacher effectiveness research (Brophy, 1979; Marshall, 1981; Peterson, 1979; and Rosenshine, 1979) have suggested the relationship is between the manner in which time in school is spent and student achievement. Specific findings in this area show the amount of time students spend actively engaged in learning is related to student achievement; low achievement gains are associated with time spent off task; the amount of teacher time spent on instruction related

interactions is positively related to student achievement."

A widely-accepted definition of engaged time is the amount of time a student actually spends attending to or trying to accomplish an academic task (Karweit & Slavin, 1981; McIntyre, Copenhaver, Byrd, and Norris, 1983). The definition of "on task" usually includes listening when instruction of assignments is given, taking part in discussion, responding to teacher expectations for transition from one activity to another, and doing assigned seat work. Researchers vary with how closely they monitor eye blinks or stares into space. Studies that report student engaged rates differ considerably in methodology. Some use anecdotal records; some use checklists; some use rating scales. Some researchers use time samples; others report real time. Some studies focus on a random sample of the children in the classroom; others record every child's behavior. Regardless of their features, all studies of engaged rate necessarily depend upon some form of direct observation. In spite of the different approaches, the findings are amazingly similar. Graden (1982) reports that studies of engaged rate yield stronger correlations with achievement than do other time variables such as length of school day or time spent in instruction.

The positive findings from the research on student engaged rates has tended to increase efforts to identify exemplary practices that schools can adopt to increase the impact of the available time on student achievement. National and local Commissions on Excellence urge schools to use time efficiently. Although the findings regarding time are easy to understand and accept, they are difficult to apply directly to classroom instruction. The engaged rate data base provides insufficient evidence to suggest the appropriate engaged rate for different grade levels and different subject areas.

There is no question as to the importance of students staying involved in classroom activities but there is little consensus on what actual engaged rates typically are or should be. Hall et. al (undated) found that students were engaged in academic tasks during only 25% of the instructional day; Fisher et. al (1980) reported a range of 25-60% for the school day; Wang and Walberg.(1983) estimated that students typically engage in academic learning tasks from 25% to 50% of the scheduled classroom time. Cooley and Leinhardt (1980) reported that the range of engaged time across academic classes varied from a low of 50% to a high of 90%. Rossmiller (1983) reviewed results of recent studies of classroom behavior and indicated the average student is on task about 70-75% of the time. Levin et. al (1980) reports high achievers as being actively involved in learning for 70% of the time and low achievers as being actively involved only 50% of the time. None of these researchers report differences in engaged rate for lower elementary, middle school, or secondary students, nor do they suggest what the appropriate rate might be.

Student attention rates are likely to vary during any instructional session of the school day. The rate may fluctuate depending upon the time of day, the activity, the delivery of content and curriculum specifics, the instructional pace kept by the teacher, the classroom climate, the mode of instruction (teacher lecture or individual seatwork), and according to individual characteristics of both teacher and child(ren) (Karweit, 1983; Hunt & Randhawa, 1983; Zagar & Bowers, 1983). The process of helping students increase their attention and stay involved during instruction is of great importance to teachers (Piontkowski & Calfee, 1979).

The attention span of children differs across ages and developmental levels (Krakow & Kopp, 1983). When addressing the issue of how long a child should be engaged in a task while learning, the notion of attention

span is of critical importance, especially with younger children. In an attempt to answer the question "Is the loss of time primarily due to student inattention?" Karweit & Slavin (1981) examined several factors in a study of time and learning in 18 elementary classrooms and noted that "across all classrooms, loss of time, due to inattention, appears as the greatest single factor."

The problem with students' inattention may be due to the teacher's unrealistic expectations of how long children should be engaged in any one task. There is evidence that low achieving secondary students stay more involved in their lessons when they are given several different tasks during each class period which require them to speak, listen, read, and write. If these students are given a single task for the whole class period (e.g., silent reading or written work), they are off task significantly more of the time (Stallings, Needels, and Stayrook, 1979).

The primary interest of the authors of this paper regarding engaged rate is its relationship to developmental attention span. How long is it reasonable to expect a first grade child to be engaged in one reading task in the fall of the year? Will this child's attention span be longer in the spring of the year and will this relate positively to engaged rate? The answers to these questions have serious implications for how teachers plan lessons for students. For example, if a first grade teacher plans a seatwork lesson for 25 minutes, and a six-year-old typically focuses attention and stays involved in a task for only 12 minutes, many children in that first-grade classroom are likely to be off task more than half of the time. It can be assumed that there are limits to how long a student can continue in any single activity. Teachers would be aided immeasureably in the planning of successful lessons if there were better information about the attention spans of students at different age levels. This paper

will compare engaged rates of children in preschool through fourth grades and make some assessment of attention span as it relates to engaged rate and achievement.

Procedures

To examine the relationships of attention span, engaged rates, grade levels, and achievement we have selected data from a Follow Through longitudinal study being conducted by the Napa County Unified School District. This study was funded by the National Institute of Education (NIE) with the intention of developing school improvement programs which would improve classroom instruction, increase student engaged rate, and increase achievement gain. As a longitudinal study, this data set has the advantage of having several data points for engaged rates and achievement for students in the kindergartens through fourth grades.

Sample

The two schools which are represented in the Napa study serve students from low income families. The schools have traditionally scored lower than other schools in their district on achievement tests. For this study we have used kindergarten, first, second, third, and fourth grades. We have not used combination grades because we are looking for developmental trends over several grade levels in attention span and engaged rates. The Follow Through program in which the children were involved focused upon increasing engaged rate; thus for our purpose we wanted to use baseline data collected before the intervention started. This sample included the following numbers of children:

kindergarten	116
first grade	95
second grade	70
third grade	80
fourth grade	55

Each child was observed in two reading classes and two mathematics classes

during October of 1982.

Instruments

The Time Off Task (TOT) observation instrument used to establish student engaged rates was developed especially for the Napa study. It collected the following off task behaviors: chatting, disruptive, personal needs, waiting, sleeping, uninvolved (Stallings, in press). Guidelines established by the National Institute of Education required the Follow Through Project to relate student engaged rate and student achievement for the same children over the several years of the project. Also required were analyses of subsamples of childrens' engaged rates and achievement scores (e.g., limited-English speaking, high achievers, and low achievers). To conduct these child level analyses, a system was devised to record each child's engaged rate and enter it into the data base with the child's identification number.

The observation process used requires an observer to systematically scan the room every five minutes during two 50-minute reading and math classes and code any off task child on an alphabetically ordered checklist of children's names. A code was also entered for the activity in which the students should have been involved when they were off task. An absence of an entry indicated the child was engaged in the appropriate behavior. Approximately 20 samples of behavior were recorded for each child in both reading and math. To compute the engaged rate, the percent of off task time was subtracted from 100%. In this manner, engaged rates were computed for each child in reading and math.

Observers were trained for the Napa study during a two-day session which included an examination of interrater agreement in classrooms. The agreement among the three observers collecting the data was .85 or above at each phase of the study. The two observers collecting the preschool data

established an interrater agreement of .81.

Achievement Tests

Achievement tests were administered to the students by each teacher in May each year of the study. School #1's district historically uses the Stanford Achievement Test, and School #2's district uses the California Achievement Test. Neither school could change tests, thus a percentile score was recorded for each student. This provided a standardized score to be used for comparative purposes. Percentile scores were transformed to normal curve equivalents for use in analyses.

Results

Descriptive statistics were used for most of the anaylses we conducted. Baseline trends of engaged rates for five through nine-year-old students were examined early in the fall semester of 1982. Reading and mathematics engaged rates were combined to establish an overall engaged rate for each child. The engaged rates for children at each grade level were then combined across classrooms in two schools. Comparing the means for each grade level, a trend was found for children's engaged rates to increase from kindergarten to fourth grade (see Table 1). The preschool data presented here was recorded in a large group setting where children were expected to take part in a sharing and question-answer period.

TABLE 1

AVERAGE ENGAGED RATES OF PRESCHOOL THROUGH FOURTH GRADE CHILDREN

Grade	Number	Mean	S.D.	Range
Kgt	116	70.1	14.6	12- 95
1st	95	75.2	10.9	28- 97
2nd	70	80.2	12.5	43-100
3rd	80	82.4	10.3	45- 97
4th	55	84.4	9.7	45-100

Not only do the engaged rate means gradually increase with age, but

also the lower end of the engaged rate range has an upward trend with age. Accordingly, the standard deviation of the fourth graders is smaller than that of the kindergartners. Computing t-tests, statistical differences in engaged rate were found between preschool and kindergarten, kindergarten and first grades, and first grades and second grades ($p < .01$). Second grade was significantly different from fourth grade ($p < .05$), but it was not statistically different from third grade.

The engaged rates shown in Table 1 are averages for these age groups, not necessarily excellent or optimum. Given those averages, what are "effective" engaged rates for different age groups? To explore this question we identified those classrooms which on the average had children scoring at or above the 50th percentile on the spring 1984 reading achievement tests. The 50th percentile was chosen as the effectiveness criteria because the children in two schools of this sample typically scored below this point. The data available for effective classroom engaged rates are contrasted with average engaged rates in Table 2. In each case only one classroom was found to meet the effectiveness criteria. There were four classrooms identified: one first grade, one first and second grade combination, one third grade, and one fourth grade. With such a small sample, we are cautious about suggesting that these are optimum engaged rates to be effective for these grade levels. Nevertheless, the data does indicate that children in these grade levels can attend to academic tasks at these rates. Furthermore, the engaged rate of classrooms scoring higher on the reading achievement test seems to increase from first to fourth grades.

TABLE 2

COMPARISON OF EFFECTIVE ENGAGED RATES WITH AVERAGE ENGAGED RATES

	Effective		Average
	Mean Achievement Scores	Mean Engaged Rate	Mean Engaged Rate
Grades			
First	50	88%	75%
First/Second	55	88%	75-80%
Third	54	91%	82%
Fourth	50	95%	84%

Another way to consider ability to stay engaged is to examine children's engaged rate in one situation and contrast it with another. Given that we had separated engaged rate for each child in reading and mathematics, we conducted a correlation analysis using children's engaged rate scores. The results of this analysis are displayed in Figure 1. A correlation of .31 ($p<.001$) was found between the math and reading engaged rate scores for the 340 children observed in the same subject. Even though significant, a .31 correlation is low and indicates that many children were not engaged at the same rate in both subjects. The letters on the figure represent the number of children at any one point (e.g., A= 1 child, B= 2 children). In order to benefit most from the time spent in academic subjects, it appears from our study that first through fourth grade children should spend at least 80 percent of their class time engaged in the specified academic tasks (see Table 2).

Therefore, using 80 percent as the criteria, lines were drawn to separate those students scoring above the 80th percentile in reading and above the 80th percentile in mathematics. In the upper right hand corner are those students scoring above the 80th percentile in both reading and mathematics; with these students we will not further concern ourselves.

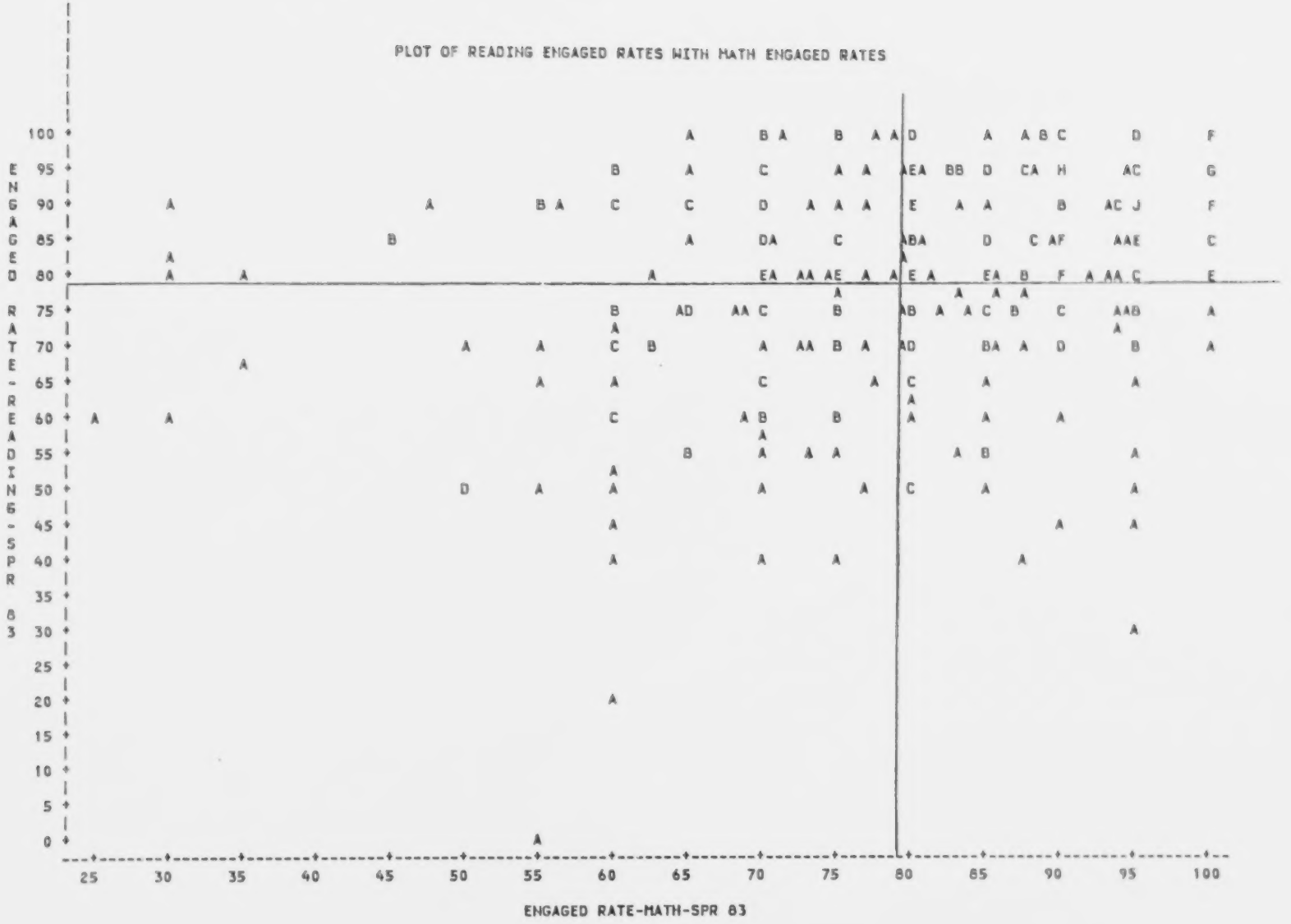

Figure 1

A = 1 student
B = 2 students
C = 3 students etc.

In the upper left hand corner are those students scoring above the 80th percentile in reading but not in math. There are 127 students in this category. In the lower right hand corner are those children highly engaged in mathematics, but not in reading. There are 137 children in this category. The engaged rate of the children in the latter two categories must be related to their interest in the subject matter or the appropriateness of the assignments rather than to their ability to pay attention during academic class time. Clearly, under some classroom conditions they can stay involved 80 percent or more of the time. The importance of this finding relates to teachers' planning. Teachers would need to plan lessons of an appropriate level and consider how to motivate these students to stay involved in both subject areas.

Children in the lower left hand corner are not engaged in either subject at an acceptable level to gain academically. These children are likely to require considerable help to increase their attention span. Certainly teachers would need to plan the length of lessons and types of activities for these children in a manner different from those students with more highly developed attention spans.

Although each child in our study is given a fixed engaged rate score, engaged rate is not continuous. Children go on and off task in different patterns. The raw data we collected indicated that these patterns are quite different for the various grade levels. For example, fourth graders typically stayed on task for 20 to 25 minutes; whereas, the preschoolers were typically on task six to eight minutes, then off task and then back on task. They were off task most often during large group teacher directed activities where children were expected to listen. Our raw data records show that after eight to ten minutes, more and more children become off task. After a time they start whispering to each other, attending to

personal needs, or become uninvolved. The majority of off task behaviors occurred when all of the children were kept waiting for material during large group activities. Given the limited nature of the preschool sample these data will not be further discussed, since the classroom observed may be atypical. It would be interesting to see how engaged rate of children vary in structured programs such as Montessori.

Summary and Implications

The several analyses presented here have implications for further research and implications for practice. Average engaged rates were identified for several grade levels. These averages were statistically different for preschool, kindergarten, first grade, and second grade. Second, third, and fourth grade rates were in a continuum of increasing 2 percent at each level, but the differences were not significant. When the average engaged rates were compared with the engaged rates of classrooms where students were effectively achieving in reading, the effective classrooms had students involved in their reading tasks 10 to 15 percent more of the time. However, the question of how much is too much time on task still remains.

The findings regarding differences in engaged rates for the same students in reading and in mathemetics have implications for lesson planning. In this case it is not that students cannot pay attention; they selectively pay attention. (The on-off patterns of students' attention is also important to consider in planning lessons and activities at any level.) If preschool children are likely to stay involved in a large group activity for eight to ten minutes, it would be unwise to plan such activities for 15 to 20 minutes. These findings also have implications for planning the length of class periods. Perhaps there should be periods of different lengths scheduled for different grade levels. How are these

decisions made? Do students learn more in a 60 minute period? Research in secondary schools suggests this is not true (Stallings, Needels, and Stayrook, 1979).

Unfortunately, in their effort to improve instruction, schools sometimes misapply research findings regarding time. In one school district recently studied, there is great effort to guarantee equal teaching time to all students. Thus, all grade levels in the elementary schools have 90 minutes for reading. In the first grade classroom there are three reading groups which each receive 30 minutes of teacher instruction. This means that each group is doing assignments alone for the other 60 minutes. Needless to say the children are frequently off task during the long periods of seatwork. Research findings on childrens' expected attention span, engaged rate, and activities which help them stay involved is needed to help guide school scheduling policies.

We caution readers from directly applying the findings reported here. Hopefully others will continue to contribute to the developing body of knowledge regarding the effective use of time for all children.

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